REMARKS

Claims 1-8 are active in the present application. The claims of the present application have been amended to conform to the claims last examined in the parent application. No new matter is added.

REQUEST FOR RECONSIDERATION

The present Inventors have discovered that local doming is responsible for image defects caused when shadow masks are subjected to local heating at temperatures of as high as 130°C (page 3, lines 20-26). The present application describes an alloy composition that effectively reduces the local doming defects to less than 40% of the local doming defects of alloys of the prior art (page 7, lines 9-14):

> "These shadow masks had an entirely austentitic structure, even after shaping or after storing in a cold environment, and their local doming defect is less than 40% of the local doming defect of shadow masks made of iron-nickel alloy according to the prior art."

A low coefficient of expansion was found to be required in order for the present alloys to avoid local doming defects.

The alloys of the present application also offer the advantage of having a high martensitic transformation start-point (M_S). As is commonly known in the art, an alloy can undergo a transformation from an austenitic to a martensitic structure by undergoing a temperature change. It is important that the martensitic start-point be as low as possible since once the alloy has undergone a structure change, the physical properties of the alloy are affected. For example, the coefficient of expansion of an alloy can be dramatically affected when the alloy undergoes a structure change from an austenitic structure to a martensitic structure.

The coefficient of expansion of an alloy is a function of the alloy's austenitic and martensitic composition. For example, a structure containing 90% austenite (coefficient of expansion 0.6 x 10^{-6}/K) and 10% martensite (coefficient 11 x 10^{-6}/K) has a coefficient of expansion of 1.64 x 10^{-6}/K which represents the weighted average of the coefficient of thermal expansion for the austenite and martensite structures. Therefore, in order to have an alloy which exhibits a high coefficient of expansion, the alloy is favorably in an austenitic structure.

The claims, as amended herein, require that the invention alloys have a martensitic start-point (M_S) of less than -50°C. A low M_S is an important feature of the invention alloys since the goods manufactured from, or containing, the alloy may be subjected to temperatures as low as -50°C during transport (i.e., air freight) or during storage, or in extreme weather conditions. If an apparatus containing a shadow mask manufactured from an alloy having a high M_S were subjected to a temperature fluctuation that led to a transformation from the austenitic to the martensitic structure, the degree of image defects would be expected to increase.

In the Office Action of September 28, 2001, Claims 1-8 were rejected under 35 U.S.C. §103 as unpatentable over Inoue et al (U.S. Patent No. 5,234,512) in view of Fukuda et al (U.S. Patent No. 5,236,522) or Ishikawa et al (U.S. Patent No. 4,832,908) or to Kato et al (U.S. Patent No. 5,164,021). In the Office Action, it is stated that the Fukuda et al, Kato et al, and Ishikawa et al patents teach the benefit of adding cobalt to an iron-nickel shadow mask described in Inoue et al. Further, it is stated that it has been held that combining known ingredients having known functions to provide a composition having the additive effect of each of the known functions is within the realm of performance of the skilled artisan and is not patentable subject matter.

Applicants note that none of the prior art cited identifies local doming as a source of image defects in shadow masks. Further, none of the prior art cited recognizes the importance of (1) achieving a low coefficient of expansion at both moderate (20-100°C) and high (80-130°C) temperatures and (2) maintaining a martensitic transformation start-point below -50°C. The present Inventors were only able to achieve the combination of the two properties described above by maintaining the alloy composition within the ranges defined for Ni, Co and Mn as shown on page 2 of the specification and as used to limit Claims 1, 7 and 8. The prior art cited does not describe an alloy which meets the criteria for these three elements.

Prior art shadow masks are known to be manufactured from Fe-Ni alloys such as those described in Inoue. These alloys are expected to have very low Martensitic start points. The addition of cobalt to these alloys is expected to increase the M_S. One of ordinary skill in the art would therefore not turn to the addition of cobalt to a shadow mask alloy as a means of improving such an alloy. The present inventors have discovered that cobalt can be added to shadow mask alloys without detrimentally affecting the M_S only when the composition of the alloy is maintained within the limits defined in Claim 1.

The simultaneous adherence to the limitations regarding Ni, Co and Mn content is not taught or suggested by any of the prior art cited. There is no disclosure in the prior art cited that would suggest a selective combination of any of the references so as to achieve the compositional makeup of the present alloy. Moreover, there is no teaching that the compositional makeup as described in the present application can be tailored by combining the various teachings of the individual references. Therefore, there is no suggestion or motivation to combine the references in order to achieve the composition of the present alloy.

Applicants therefore respectfully submit that the present invention is unobvious over the prior art cited, and request the withdrawal of the rejection.

It is respectfully submitted that this amendment to the claims places all claims in condition for allowance. Applicants thus respectfully request the reconsideration and withdrawal of the outstanding rejections, and the passage of all now-pending claims to issue.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Norman F. Oblon
Attorney of Record
Registration No. 24,618

Stefan U. Koschmieder, Ph.D.
Registration No. P 50,238

22850

(703) 413-3000
RLT/kst

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IN THE CLAIMS

--1. (Amended) An Fe-Ni-Co alloy whose chemical composition comprises, by weight based on total weight:

$32\% \leq Ni \leq 34\%$

$3.5\% \leq Co \leq 6.5\%$

$0\% \leq Mn \leq 0.1\%$

$0\% \leq Si \leq 0.1\%$

$0\% \leq Cr \leq 0.1\%$

$0.005\% \leq C \leq 0.02\%$

$S \leq 0.001\%$

$0.0001\% \leq Ca \leq 0.002\%$

$0.0001\% \leq Mg \leq 0.002\%$

and further comprising iron and impurities resulting from smelting; the chemical composition of the alloy furthermore satisfying the relationships:

$Co + Ni \leq 38.5\%$

$Co + 0.5 \times Ni \geq 20\%$

$Co + 5 \times Ni \geq 165.5\%$

and

$S \leq 0.02 \times Mn + 0.08 \times Ca + 0.6 \times Mg$

wherein said alloy has a martensitic transformation start point of less than -50°C, an average coefficient of thermal expansion between 20° and 100°C of less than or equal to 0.7 x

10^{-6}/°K and a mean coefficient of thermal expansion between 80°C and 130° of less than or equal to 1 x 10^{-6}/°K.

7. (Amended) A shadow mask, which comprises at least one foil having holes, said foil comprising an alloy whose chemical composition comprises, by weight based on total weight:

$32\% \leq Ni \leq 34\%$

$3.5\% \leq Co \leq 6.5\%$

$0\% \leq Mn \leq 0.1\%$

$0\% \leq Si \leq 0.1\%$

$0\% \leq Cr \leq 0.1\%$

$0.005\% \leq C \leq 0.02\%$

$S \leq 0.001\%$

$0.0001\% \leq Ca \leq 0.002\%$

$0.0001\% \leq Mg \leq 0.002\%$

and further comprising iron and impurities resulting from smelting; the chemical composition of the alloy further satisfying the relationships:

$Co + Ni \leq 38.5\%$

$Co + 0.5 \times Ni \geq 20\%$

$Co + 5 \times Ni \geq 165.5\%$

and

$S \leq 0.02 \times Mn + 0.08 \times Ca + 0.6 \times Mg$

wherein said alloy has a martensitic transformation start point of less than -50°C, an average coefficient of thermal expansion between 20° and 100°C of less than or equal to 0.7 x

$10^{-6}/°K$ and a mean coefficient of thermal expansion between 80°C and 130°C of less than or equal to $1 \times 10^{-6}/°K$.

8. (Amended) A method of forming a shadow mask, comprising the steps of forming holes in a foil and drawing said hole-containing foil, wherein the foil comprises an alloy having a chemical composition which comprises, by weight based on total weight:

$32\% \leq Ni \leq 34\%$

$3.5\% \leq Co \leq 6.5\%$

$0\% \leq Mn \leq 0.1\%$

$0\% \leq Si \leq 0.1\%$

$0\% \leq Cr \leq 0.1\%$

$0.005\% \leq C \leq 0.02\%$

$S \leq 0.001\%$

$0.0001\% \leq Ca \leq 0.002\%$

$0.0001\% \leq Mg \leq 0.002\%$

and further comprising iron and impurities resulting from smelting; the chemical composition of the alloy further satisfying the relationships:

$Co + Ni \leq 38.5\%$

$Co + 0.5 \times Ni \geq 20\%$

$Co + 5 \times Ni \geq 165.5\%$

and

$S \leq 0.02 \times Mn + 0.08 \times Ca + 0.6 \times Mg$

wherein said alloy has a martensitic transformation start point of less than -50°C, an average coefficient of thermal expansion between 20° and 100°C of less than or equal to 0.7 x

10^{-6}/°K and a mean coefficient of thermal expansion between 80°C and 130°C of less than or equal to 1 x 10^{-6}/°K.--